

THE DIFFERENTIAL CHARACTERS OF CHARACINOID AND ERYTHRINOID FISHES.

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IN MY list of Families and Subfamilies of Fishes (1893) I have admitted two families of Heterognaths, Characidae (or Characinidae) and Erythrinidae. As the limits and concepts of which they are the expressions are quite different from those hitherto current, it is a duty to no longer defer the reasons which have influenced me.

The two families in question have been admitted by other naturalists, but have only been differentiated by the development of an adipose fin in one (Characiniids) and the absence of it in the other (Erythrinuids). The mere presence or absence of a bag of adipose tissue is, however, of too little importance to justify distinction as a family character, although in most cases it happens to be coordinate with other features, and hence available as a diagnostic mark.¹ Nevertheless, in at least the entire subfamily Stevardiinae it fails, for the small fishes in question appear to be more nearly related to Tetragonopterines than to Erythrinines. A character of more importance, apparently coordinate with other structural modifications, and which has been the cause of my accepting the two families, is to be found in the structure of the posterior part of the skull. The differences observable in due examination are expressible in the following diagnoses:

Family CHARACINIDÆ.

(*Primary Synonymy.*)

- <*Dermoptères*, DUMÉRIL, Zool. Analytique, p. 146, 1806.
- <*Salmonidi*, RAFINESQUE, Indice d'Ittiolog. Siciliana, p. 32, 1810.
- <*Dermopteria*, RAFINESQUE, Analyse de la Nature, p. 87, 815.
- <*Characini*, MÜLLER, Archiv Naturgesch., 9. Jahrg., I, p. 323, 1843.
- <*Characius* (*Characidæ*), AGASSIZ, Rep. Brit. Assn. Adv. Sci., 1844, p. 293.

¹The development of an adipose fin may occasionally fail as a generic and even specific character, as among the Nannostomi. "Nur bei einer einzigen dieser Arten fehlt die Fettflosse vollständig; bei einer zweiten Art besitzen von vier Exemplaren drei eine Fettflosse, während sie dem vierten Individuum fehlt" (Steindachner, Ich. Beitr., V, p. 74, 1876).

- × *Characins*, VALENCIENNES, Hist. Nat. des Poissons, XXI, p. 159, 1848.
- ⟨ *Characina*, VOGT, Zool. Briefe, II, p. 150, 1851.
- × *Myletidæ*, ADAMS, Man. Nat. Hist., p. 108, 1854.
- × *Characiniðæ*, RICHARDSON, Encycl. Brit., 8th ed., XII, p. 245, 1856.
- × *Characinoidei*, BLEEKER, Enum. Sp. Piscium Archipel. Indico, p. 31, 1859.
- ⟨ *Characiniðæ*, GÜNTHER, Cat. Fish. Brit. Mus., V, p. 278, 1864.
- ⟨ *Characiniðæ*, COPE, Proc. Am. Assoc. Adv. Sci., 1871, p. 333 (1872).
- ⟨ *Characiniðæ*, GILL, Arrang. Fam. Fishes, p. 16, 1872.
- ⟨ *Citharini*, FITZINGER, Sitzungsber. K. Akad. Wiss. Wien, LXXVII, 1. Abth., p. 37, 1873.
- ⟨ *Characiniðæ*, SCHMARDÀ, Zool., II, p. 377, 1878.
- ⟨ *Characiniðæ*, JORDAN and GILBERT, Syn. Fishes N. Amer., p. 254, 1882.
- = *Characidæ*, GILL, Mem. Nat. Acad. Sci., VI, p. 131, 1893.

(Secondary Synonymy.)

- ⟨ *Salmones*, CUVIER, Règne Animal [1^{re} éd.], II, p. 159, 1817; 2^{re} éd., II, p. 301, 1829.
- ⟨ *Salmonides*, LATREILLE, Fam. Nat. Règne Animal, p. 119, 1825.
- ⟨ *Salmones*, AGASSIZ, Sel. Gen. et Sp. Piscium q. coll. Spix, p. 56, 1829.
- ⟨ *Salmonidae*, BONAPARTE, Giorn. Accad. di Scienze, III, p. 95 (Saggio Distrib. Metod. Animal. Vertebr. a Sangue Freddo, p. 37), 1832.
- ⟨ *Salmonidae*, SWAINSON, Nat. Hist. and Class. Fishes, etc., II, pp. 184, 283, 1839.
- ⟨ *Salmonidae*, BONAPARTE, Nuovi Annali delle Sci. Nat., II, p. 132, 1838; IV, p. 272, 1840.
- ⟨ *Characiniðæ*, SAGEMEHL, Morph. Jahrb., X, p. 1, etc., 1885.

(Synonyms of Characiniðæ.)

- ⟨ *Characini*, LATREILLE, Fam. Nat. Règne Animal, p. 119 ("Tribu").
- ⟨ *Salmonini*, BONAPARTE, Giorn. Accad. di Scienze, LII, 95 (Saggio Distrib. Metod. Animal. Vertebr. a Sangue Freddo, p. 37), 1832.
- ⟨ *Salmoninae*, SWAINSON, Nat. Hist. and Class. Fishes, etc., II, pp. 185, 286, 1839.
- ⟨ *Hydrocyonini*, BONAPARTE, Nuovi Annali delle Sci. Nat., II, p. 132, 1838; IV, p. 273, 1840.
- ⟨ *Characiniñæ*, BONAPARTE, Cat. Met. Pesci Eur., p. 5, 1846: Conspectus Syst. Piscium, 1850.
- ⟨ *Leiogastriformes*, BLEEKER, Enum. Sp. Piscium Archipel. Indico, p. xxxii, 1859.
- ⟨ *Hydrocyonina*, GÜNTHER, Cat. Fish. Brit. Mus., V, pp. 280, 345, 1864.
- ⟨ *Hydrocyonina*, GILL, Mem. Nat. Acad. Sci., VI, p. 131, 1893.

Heterognaths with the skull above more or less invaded by reentering valleys from behind, and the supraoccipital having a horizontal extension and carinated by a procurent crest.

Family ERYTHRINIDÆ.

(Primary Synonymy.)

- ⟨ *Erythröides*, VALENCIENNES, Hist. Nat. Poiss., XIX, p. 480, 1846.
- ⟨ *Erythrinida*, RICHARDSON, Encycl. Brit., 8th ed., XII, p. 250, 1856.
- ⟨ *Erythrinoidæ*, BLEEKER, Enum. Sp. Piscium Archipel. Indico, p. xxxi, 1859.
- = *Erythrinidae*, GILL, Annals Lye. Nat. N. Y., VI, p. 410, 1858.
- ⟨ *Erythrinida*, COPE, Proc. Am. Assoc. Adv. Sci. 1871, p. 333 (1872).
- ⟨ *Erythrinini*, FITZINGER, Sitzungsber. K. Akad. Wiss., Wien, LXVII, 1. Abth., p. 37, 1873.
- = *Erythrinidæ*, GILL, Mem. Nat. Acad. Sci., VI, p. 131, 1893.

(Secondary Synonymy.)

<*Siagonotes*, DUMÉRIL, 1806.
 <*Clupeidae*, BONAPARTE, 1832-1840.
 <*Characini*, MÜLLER et al.
 <*Characinidae*, GÜNTHER et al.

(Synonyms of *Erythrininae*.)

<*Erythrichthini*, BONAPARTE, Nuovi Annali Sci. Nat., II, p. 132, 1838; IV, p. 196, 1840.
 <*Cyprina*, SWAINSON, Nat. Hist. and Class. Fishes, etc., II, pp. 184, 283, 1839.
 <*Erythrichthini*, BONAPARTE, Trans. Linn. Soc., XVIII, p. 300, 1840-41.
 <*Erythrichthini*, BONAPARTE, Cat. Met. Pesci Enr., p. 5, 1846; Cons. Syst. Pisc., 1850.
 <*Erythrinina*, GÜNTHER, Cat. Fish. Brit. Mus., V, pp. 278, 281, 1864.
 <*Erythriniformes*, BLEEKER, Enum. Sp. Piscium Archipel. Indico, p. xxxi, 1859.
 =*Erythrininae*, GILL, Mem. Nat. Acad. Sci., VI, p. 131, 1893.

Heterognaths with the skull above more or less truncated behind, and the supraoccipital confined to the posterior surface and carinated by a rudimentary or obsolete vertical crest.

There is good reason to believe that the Characinidae, as here still preserved, constitute a heterogeneous group, and may hereafter be subdivided into two or more families, but the material at hand is insufficient to confirm the suspicions entertained or to properly refer the species to their respective families. Great differences are observable in the relative development of the jaws, the composition of the lower jaw, the branchial apparatus, etc.¹

BIBLIOGRAPHY.

The illustrations of the skeletal features of the representatives of the family being much scattered, a list of most of them is here appended. More valuable than all others and accompanied by philosophical views are those given in Sagemehl's Memoir.

GENERAL BIBLIOGRAPHY

Sagemehl (Dr. M.). Beiträge zur vergleichenden Anatomie der Fische. I-IV.

Morph. Jahrbuch, IX-XVII, viz:

- I. Das Cranium von *Amia calva*. IX, pp. 177-228, pl. 10, 1881.
- II. Einige Bemerkungen über die Gehirnhäute der Knochenfische. IX, pp. 457-474, pl. 23, 1884.
- III. Das Cranium der Characiniden, nebst allgemeinen Bemerkungen über die mit einem Weber'schen Apparat versehenen Physostomafamilien, X, pp. 1-119, pls. 1, 2, 1885.
- IV. Das Cranium der Cyprinoiden. XVII, pp. 489-595, pls. 28, 29, 1891.

¹ According to Sagemehl (III, p. 105, pl. 1, fig. 14), *Citharinus* has the lower jaw composed of only two lateral elements, a greatly elongated articular bone and reduced dentary. These peculiarities are coordinated with other cranial characters and with modifications of the branchial apparatus. *Citharinus* seems therefore to be the type of a peculiar family (Citharinidae). Of course such a family is very different from that named *Citharini* of Fitzinger, which is the same as Characinidae. It would also differ much from the subfamily *Citharina* of Thominot (Bull. Philomath. Soc., (7) VI, p. 250, 1882), which includes the Citharininae and most of the Curimatinae, but not the typical genus *Curimata* or the edentulous forms. The genera included by Thominot are *Saccodon*, *He niodus*, *Parodon*, *Citharinus*, *Prochilodus* and *Cnnotropis*.

BIBLIOGRAPHY OF SPECIES.

Subfamily ERYTHRININÆ.

Erythrinus unitaeniatus, SPIX.¹*Erythrinus unitaeniatus*, SAGEMEHL, Morph. Jahrb., X, p. 26, pl. 1, figs. 1-12 (skull), 1885; EIGENMANN, Proc. Cal. Acad. Sci. (2), II, p. 105, pl. 1, fig. 2 (jaws), 1889.*Macrodon tareira*, BLOCH.*Macrodon trahira*, STEINDACHNER, Denkschr. Akad. Wiss. Wien, XLII (Fisch. Canca), p. 14, pl. 5, fig. 3 (articulation of dentary), 1879.*Macrodon malabaricus*, EIGENMANN, Proc. Cal. Acad. Sci. (2), II, p. 102, pl. 1, fig. 1 (jaws), 1889.Subfamily PYRRHULININÆ.²*Pyrrhulina guttata* (STEINDACHNER).*Pyrrhulina guttata*, EIGENMANN, Proc. Cal. Acad. Sci. (2), II, p. 108, pl. 1, fig. 3 (jaws), 1889.

Subfamily LEBIASININÆ.

Lebiasina bimaculata (CUVIER and VALENCIENNES).*Lebiasina bimaculata*, EIGENMANN, Proc. Cal. Acad. Sci. (2), II, p. 113, pl. 1, fig. 5 (jaws), 1889.

Subfamily TETRAGONOPTERINÆ.

Tetragonopterus mexicanus, FILIPPI.*Tetragonopterus mexicanus*, STEINDACHNER, Sitzungsber. K. Akad. Wiss., Math. Nat. Cl., LX, 1. Abth., p. 300 (Ich. Not., IX), pl. 4, figs. 2-4 (Pharyngobones), 1869-70.

Subfamily SERRASALMONINÆ.

Serrasalmo —.*Serrasalmo* —, ROSENTHAL, Ichthiotom, Tafeln, pl. 6, 1816.*Pygocentrus piraya*, LACÉPÈDE.a. *Pygocentrus piraya*, HYRTL, Denkschriften K. Akad. Wiss. Wien, Math. Nat. Cl., XXI, p. 7, pl. [1], fig. 5 (br. skel.), 1863.b. *Serrasalmo piraya*, KLEIN, Jahreshefte d. Vereins f. Vaterl. Naturk. in Württemberg, 40. Jahrg. (1884), pp. 157, 226, pl. 2, figs. 12, 13; 42. Jahrg. (1886), p. 261, pl. 7, fig. 28; p. 291, pl. 8, fig. 53 (cr. bones).*Myloplus* —.*Myletes* —, GERVais, Castelnau's Expéd. dans l'Amérique du Sud, Anat., p. 97, pl. 2 (skull), 1856.*Myloplus oligacanthus* (MÜLLER and TROSCHEL).*Myletes oligacanthus*, KLEIN, Jahreshefte d. Vereins f. Vaterl. Naturk. in Württemberg, 40. Jahrg. (1881), pp. 159, 227, pl. 2, figs. 14, 15.

¹The genus *Erythrinus* (Gouyvin, Scopoli) was based exclusively on a species without pterygoid teeth, and consequently the section so distinguished should retain the name instead of *Hetererythrinus*, while the subgenus (or genus) differentiated by the development of pterygoid teeth (typified by *E. unitaeniatus*, Spix) may be called *Hopterythrinus*.

It seems advisable also to direct attention to the *Grundulus* of Valenciennes, referred by that naturalist next to *Hydrargyra* (XVIII, pp. 216-220). It appears to me to be related to *Pyrrhulina*, if not a species of that genus, and therefore a Characinid. Valenciennes himself (XVIII, p. 219) remarked that it cannot be denied that the number of branchiostegal rays and the bilobate air bladder agree with Characin characteristics.

Subfamily HYDROCYONINÆ.

Hydrocyon forskalii, CUVIER.

Hydrocyon forskali, KLEIN, Jahreshefte d. Vereins f. Vaterl. Naturk. in Württemberg, 35. Jahrg. (1879), p. 104, pl. 1, fig. 13 (mast.); 40. Jahrg. (1881), p. 156, pl. 2, figs. 10, 11; 41. Jahrg. (1885), pp. 195, 211, pl. 3, figs. 73, 74; 42. Jahrg. (1886), p. 261, pl. 7, fig. 27; p. 291, pl. 8, fig. 52 (cr. bones).

Subfamily MYLETINÆ.¹

Myletes dentex, LINNÆUS.

Alestes dentex, SAGEMEHL, Morph. Jahrb., X, p. 26, pl. 2, figs. 17, 18 (skull), 1885.

Subfamily DISTICHODONTINÆ.

Distichodus aegyptius, GMELIN.

a. *Distichodus niloticus*, HYRTL, Denkschriften K. Akad. Wiss. Wien, Math. Nat. Cl., XXI, p. 7, pl. [1], fig. 6 (br. skel.), 1863.
b. *Distichodus kammar*, METTENHEIMER, Disq. anat. comp. membro pisc. pect., pl. 2, fig. 12 (sh. girdle), 1847.

Subfamily ANOSTOMINÆ.

Leporinus elongatus, STEINDACHNER.

Leporinus elongatus, STEINDACHNER, Denkschr. K. Akad. Wiss. Wien, Math. Nat. Kl., XXXIX (Fish. Mag., pp. 38, 39), pl. 10, figs. 3-5 (preop. and quadrate), 1878.

Subfamily CURIMATINÆ.

Prochilodus brama, VALENCIENNES.

Prochilodus brama, HYRTL, Denkschriften K. Akad. Wiss. Wien, Math. Nat. Cl., XXI, p. 7, pl. [1], fig. 3 (br. skel.), 1863.

Subfamily CITHARININÆ.

Citharinus geoffroyi, CUVIER.

Citharinus geoffroyi, HYRTL, Denkschriften K. Akad. Wiss. Wien, Math. Nat. Cl., XXI, p. 7, pl. [1], fig. 4 (br. skel.), 1863.—SAGEMEHL, Morph. Jahrb., X, p. 26, etc., pl. 1, fig. 14; pl. 2, figs. 1-11 (skull), 1885.

¹ Myletinae (or better Mylitinæ), not Myletidini—*μυλητης*, ov, millstone or grinder.